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COST ANALYSIS STRATEGY ASSESSMENT MODEL (CASA)

Logistics We Holler
Costs Many a Dollar,
So Leave It to Last
'Cause We're so Short of Cash.

Anon.

16.1 OVERVIEW

The Cost Analysis Strategy Assessment Model (CASA) was developed by the Defense Systems Management College (DSMC) in response to a broad range of requirements gathered from many of the Services' acquisition program offices. Over the past several years the model has been validated and used successfully by all of the DoD Services, industry contractors, and other government agencies such as the Federal Aviation Administration (FAA) and the National Oceanic and Atmospheric Administration (NOAA). The model has evolved to the current 3.01 version and more enhancements are planned as user requirements evolve.

This article is designed to acquaint the reader with a useful, general purpose Life Cycle Cost (LCC) model, to announce that the model continues to be available, and that model upgrades are planned. The article summarizes the PM's need for a LCC model, discusses what constitutes a useful model, and specifically describes the CASA model.

16.2 THE REQUIREMENT FOR AN LCC MODEL

The PMs need a tool that will focus the efforts of the Integrated Product Team (IPT). They need a concise method of assuring themselves, program management, and decision-makers at all levels that reasonable decisions are being made. A review of the policies, definitions, and objectives of Systems Engineering (SE) and Acquisition Logistics in DoD 5000.2-R will lead to the conclusion that an effective system support program is one that provides support and achieves the user's readiness requirement(s) using the most life-cycle cost-effective approach. The bottom line of the PM's efforts must focus on these two key quantifiable requirements: maximized mission readiness and minimized total cost**.**

The PM must ensure that the LCC factors are developed in a timely manner and that they influence system design and systems engineering processes during all acquisition phases. In accomplishing this goal, the PM needs a comprehensive, accurate, and current LCC estimate to support each management decision where cost is significant. There are few decisions made during a program's life cycle that do not affect LCC. An LCC estimate should have sufficient accuracy to permit comparison of relative costs of design and acquisition alternatives under consideration by management. In other words, LCC is a decision aid; and the LCC estimate should capture enough of the total ownership costs to facilitate well-informed decisions. The two main goals of LCC analysis are to: (1) identify the total cost of alternative means of countering a threat, achieving production schedules, and attaining system performance and readiness objectives and (2) estimate the overall cost impact of the various design and support options.

The decisions with the greatest chance of affecting LCC and identifying savings are clearly those impacting acquisition and Operating and Support (O&S) costs that are undertaken in the early stages of system development (concept exploration, program definition, and risk reduction phases). But, this does not imply that LCC tradeoff analyses are not useful during later program phases. During the production, deployment/fielding, and operational support phase, the evaluation of actual readiness data and resource consumption information, which are taken from maintenance data collection systems, regularly lead to identification of "bad actors" in need of corrective actions, such as improved reliability through an Engineering Change Proposal (ECP).

16.3 CHARACTERISTICS OF A USEFUL LCC MODEL

Rodney Stewart describes the most valuable automated cost-estimating tools as "the generic computer tools that can be used for any application . . ." Blanchard and Fabrycky say the model should be:

- comprehensive, include all relevant factors, and be reliable in terms of repeating results;
- representative of the "dynamics" of the system or product being evaluated and be sensitive to the relationships of key input parameters;
- flexible to the extent that the analyst can evaluate overall system requirements as well as the individual relationships of various system components. In the analysis process, one may wish to view the system as a whole, identify high-cost contributors, evaluate one or more specific components of the system independent of other elements, initiate changes at the component level, and present the results in the context of the overall system;
- designed to simplify timely implementation because, unless the analyst can use the model in a timely and efficient manner, it is of little value; and
- designed so it can be modified to incorporate additional capabilities. For example, it may be necessary to expand (or tailor) certain facets of the cost breakdown structure to gain additional visibility.

An LCC estimate should have sufficient accuracy to permit comparison of relative costs of design and acquisition alternatives under consideration by management. This statement means that an LCC model serves as a decision aid, and the model needs to capture enough (not necessarily all) of cost of ownership to facilitate well-informed decisions. The model developer identifies the main cost drivers of LCC and creates model algorithms to capture these costs.

A general-purpose model, which captures the costs of a systems major end item in terms of production, initial support items, operational use, and also the recurring costs on all of the ten support elements, can be expected to produce a good LCC estimate.

The cost analysis process includes the use of a detailed life-cycle cost model and aspects of risk, sensitivity, and data comparison analyses. Also, Research, Development, Test, and Evaluation (RDT&E) cost concerns as well as acquisition, operation, and support costs over the effective life of the system are included. Thus, a good life-cycle model covers the entire life of a system, from its initial research cost to those costs associated with yearly maintenance. Also, a good life cycle model covers spares, training costs, and other expenses that are incurred once the system is delivered.

The analyst formulates the problem statement to be analyzed, selects the appropriate model, and collects the appropriate amount of model input data. (Some model data may be left blank if it is not relevant to the problem statement.) The analyst also runs the model (including selected sensitivities) and draws certain conclusions from the model outputs. Later discussion will show that the CASA model fits all of these requirements. Professor Blanchard recently stated that the CASA model is the best LCC model available today.

16.4 DISCUSSION OF AVAILABLE COST MODELS

Research shows that a wide variety of LCC models have been developed. Some of these models are special purpose and others are general purpose. The government has regularly required that proposing contractors use the "government approved" models in estimating the cost of ownership of the proposed solution. This requirement ensures that all of the contractors and government LCC estimates are comparable, repeatable, and understandable. Many of these models are cataloged in the DoD Acquisition Logistics Guide distributed by the Logistics Support Activity (LOGSA), an agency of the Army Material Command that serves all of DoD in the area of logistics supportability assessment and related tools.

Interviews and surveys of many industry representatives have resulted in a finding that many government models were considered unnecessarily complex and "input data hungry." Both industry and government program managers need a flexible model that can operate effectively with tailored levels of input detail, from simple to complex, depending on the decision being considered.

16.5 THE CASA MODEL

The CASA model is basically a management decision-aid tool based on LCC. CASA is a set of analysis tools formulated into one functioning unit. It collects, manipulates, and presents as much of the total cost of ownership as the user desires. It contains a number of programs and submodels that, along with LCC comparisons and summations, allow the user to generate program data files, perform life-cycle costing, perform sensitivity analysis, and perform LCC risk analysis. CASA offers a wide variety of preprogrammed output report formats designed to support the analysis process.

CASA covers the entire life of the system, from its initial research costs to those associated with yearly maintenance. It also covers spares, training costs, and other expenses once the system is delivered. Currently, RDT&E and production costs are "throughput" costs, i.e., they are not derived by the model; they are input and reported in some report outputs depending on their relevance to the analysis. The model calculates and projects the O&S costs over the 20 to 30 years of system operation. RDT&E and production cost-estimating modules are being considered in response to numerous user requests.

The CASA model employs some 82 algorithms with 190 variables. Only a small number of the inputs are mandatory. Most of the inputs are optional and are subject to tailoring to the needs of the analysis. CASA, therefore, is a relatively "compact" model designed to facilitate well-informed decisions while holding model input data gathering to a moderate level.

CASA works by taking the data entered, calculating the projected costs, and determining the probabilities of meeting, exceeding, or falling short of any LCC target value. CASA offers a variety of strategy options and allows for alteration of original parameters to observe the effects of such changes on strategy options.

At any number of program junctions, inputs may be saved and calculations may be made to that point for later evaluation. Furthermore, CASA will accept only correct input. The CASA checks all data as it is entered; incorrect data will cause the cursor to stop and/or alert the user.

CASA can be used for a wide range of analysis tasks, such as:

- LCC estimates,
- tradeoff analyses,
- repair-level analyses,
- production-rate and quantity analyses,
- warranty analyses,
- spares provisioning,

- resource projections (e.g. manpower and support equipment),
- risk and uncertainty analyses.
- cost-driver sensitivity analyses,
- reliability growth analyses,
- operational availability analyses with automated sensitivity analysis,
- spares optimization to achieve readiness requirements, and
- operation and support cost contribution by individual Line Replaceable Units (LRUs).

16.5.1 CASA Model Version 3.01

CASA version 3.01 has been distributed since 1995. This version expands the number of hardware items (repairable candidates) from 145 to 2,000. This feature, along with the LCC summation feature, virtually eliminates any limitation on the "size" of a system that can be analyzed. The model runs well on 386, 486, and Pentium PCs. It requires four to five megabytes of hard drive space, depending on the size of hardware data files. The program currently runs best in a DOS environment since it requires 580K of RAM to operate properly.

16.5.2 CASA Model Version 4.0

The newest version of CASA is in a Windows 95/NT format. This version includes many new features, including an embedded hypertext, paperless technical manual, and embedded computer-based training (CBT). The new model will retain all of the functionality of the previous versions, plus add the following features:

- ability to assign an operational availability target to be used in sparing to availability calculations;
- more flexibility in describing maintenance levels, i.e., regional maintenance;
- ad hoc rather than canned output reports and graphical output formats;
- digital technical manual imbedded into hyperlinked help files; and
- CBT and "wizard"-type examples.

Version 4.0 for Windows, like version 3.01 for DOS, expanded the number of hardware items (repairable candidates) from 145 to 2,000. This feature, along with the LCC summation feature, virtually eliminated any limitation on the "size" of a system that can be analyzed. Other new features are being considered in response to user requirements.

16.6 SOURCES OF THE CASA MODEL

The CASA model comes compressed on two program file disks; one disk contains the user's manual. There are a variety of sources of the model. Some sources distribute the model essentially free, but they offer limited user support. Other sources distribute the model for a modest fee to recover distribution and technical support costs. LOGSA is preparing to begin the distribution of CASA as a module of the logistics manager's tool set called Logistics Planning and Requirements Simplification (LOGPARS). Three points of contact for internal U.S. distribution of the model are:

- Defense Systems Management College, Logistics Management Department, (703) 805-2497

- US Army Materiel Command, Logistics Support Activity (LOGSA), (205) 955-988

- MAR-YAN Associates Inc., (301) 460-4050